

REMARKS

Applicant respectfully requests reconsideration of the present application in view of the reasons that follow.

No claims are currently being amended. Claims 2-14 and 16-36 are now pending in this application.

Rejections under 35 U.S.C. § 103

Claims 2-4, 7-15, 17, 18, 27-30 and 33-35 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,688,279 to Ishikawa et al. (hereafter “Ishikawa”) in view of U.S. Patent No. 6,412,276 to Salvat et al. (hereafter “Salvat”). Claims 5, 6, 19, 31, 32 and 36 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishikawa in view of U.S. Patent No. 4,685,290 to Kamiya et al. (hereafter “Kamiya”). Claims 16, 20, 21 and 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishikawa in view of U.S. Patent No. 6,804,952 to Sasaki et al. (hereafter “Sasaki”). Claims 22-25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishikawa in view of U.S. Patent No. 6,796,118 to Kitahara (hereafter “Kitahara”). Applicant respectfully traverses these rejections for at least the following reasons.

Independent claim 2 recites “the controller is configured . . . to perform a main fuel injection to start the main combustion after the preliminary combustion is finished,” and “wherein the controller is configured to perform the preliminary fuel injection at such a timing as to cause a heat releasing process of the preliminary combustion to start before compression top dead center and to end after compression top dead center.” Thus, in claim 2, preliminary fuel injection is performed at such a timing as to cause a heat releasing process of the preliminary combustion to start before compression top dead center and to end after compression top dead center, while the main fuel injection is performed to start the main combustion after the preliminary combustion is finished. The references applied in the rejections fail to disclose at least this feature of claim 2, and in particular Ishikawa does not disclose performing a preliminary fuel injection at such a timing as to cause a heat releasing

process of the preliminary combustion to start before compression top dead center and to end after compression top dead center, and additionally performing main fuel injection to start the main combustion after the preliminary combustion is finished.

Ishikawa discloses a compression-ignition internal combustion engine including a controller 26 for conducting pilot fuel injections (1) through (4) and a main fuel injection. FIGs. 3 and 4 of Ishikawa disclose the rate of heat release for the pilot fuel injections.

Ishikawa, however, does not disclose as recited in claim 2, performing a preliminary fuel injection at such a timing as to cause a heat releasing process of the preliminary combustion to start before compression top dead center and to end after compression top dead center, and additionally performing main fuel injection to start the main combustion after the preliminary combustion is finished. With respect to the feature where the preliminary fuel injection is performed so as to cause a heat releasing process of the preliminary combustion to start before compression top dead center and to end after compression top dead center, the Patent Office on page 14 of the Office Action states that Ishikawa's FIG. 4 shows a slight heat release which starts before and continues past top dead center. However, presuming for the sake of argument that a slight heat release shown in FIG. 4 of Ishikawa is a preliminary combustion caused by a preliminary injection, then FIG. 4 of Ishikawa shows the main injection starts during the preliminary combustion, and thus continuous combustion is produced. In this case, Ishikawa does not disclose performing main fuel injection to start the main combustion after the preliminary combustion is finished. Thus, presuming for the sake of argument that Ishikawa in FIG. 4 discloses a preliminary combustion that starts before compression top dead center and ends after compression top dead center, Ishikawa does not disclose starting the main combustion after the preliminary combustion is finished.

Salvat, Kamiya, Sasaki and Kitahara were cited for other features of the claims, but fail to cure the deficiencies of Ishikawa.

Moreover, Salvat, which was cited for disclosing a particulate filter for an internal combustion engine, teaches prolonging combustion as long as possible in order to obtain higher gas temperature in the combustion chamber so as to trigger combustion of soot in the

particulate filter 4 (See col. 2, lines 61-67), discloses producing a continuous combustion. Therefore, if the system of Ishikawa were modified according to the teachings of Salvat to include a particulate filter in order to take the advantage of reduced particulate emission, the resulting system would produce a continuous combustion, and would not have the feature of claim 2 where the main combustion is started after the preliminary combustion is finished.

Independent claims 30 and 32 respectively recite features corresponding to those discussed above with respect to claim 2, and are thus patentable for analogous reasons.

The dependent claims are patentable for at least the same reasons as their respective independent claims, as well as for further patentable features recited therein.

For example, with respect to claim 3, the Patent Office cites to Salvat at col. 2, line 61 to col. 3, line 20. Salvat, however, merely discloses continuous combustion, and fails to disclose the split combustion as recited in claim 3. With respect to claim 4, the Patent Office cites to Salvat at col. 2, lines 47-67. The Salvat system, however, in contrast to claim 4, does not use the condition of the exhaust purifier 4 to trigger the changeover of the combustion control mode from the mode of FIG. 2 to the mode of FIG. 3. With respect to claim 16, Sasaki is silent regarding the compression end temperature recited in that claim.

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing or a credit card payment form being unsigned, providing incorrect information resulting in a rejected credit card transaction, or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If

any extensions of time are needed for timely acceptance of papers submitted herewith,
Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment
of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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